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55 Leicester Street, Brookline, MA 02146 (US).

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(74) Agents: CERPA, Robert, K. et al.; Morrison & Foerster  
LLP, 755 Page Mill Road, Palo Alto, CA 94304-1018 (US).

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TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.(71) Applicants (*for all designated States except US*): DIGIS-  
CENTS [US/US]; Suite 720, 1814 Franklin Street, Oak-  
land, CA 94612 (US). YEDA RESEARCH AND DE-  
VELOPMENT CO., LTD. [IL/IL]; Weizmann Institute of  
Science, P.O. Box 95, 76100 Rehovot (IL).(84) Designated States (*regional*): ARIPO patent (GH, GM,  
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(72) Inventors; and

(75) Inventors/Applicants (*for US only*): BELLENSON, Joel  
[US/US]; 244 Lakeside Drive, Apartment 15, Oakland,  
CA 94612 (US). SMITH, Dexter [US/US]; 868 Trestle  
Glen Road, Oakland, CA 94610 (US). LANCET, Doron  
[IL/IL]; 15 Weizmann Street, 76280 Rehovot (IL). GLUS-  
MAN, Gustavo [IL/IL]; 33/37 Ha'Alon Street, 79845  
Bnei Ayish (IL). FUCHS, Tania [IL/IL]; 12 Harav neria

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(54) Title: OLFACTORY RECEPTOR SEQUENCES

(57) Abstract: The present invention provides polynucleotide sequences which encode polypeptides involved in olfactory sensation. The present invention also provides the polypeptides encoded by these polynucleotide sequences, vectors comprising these polynucleotide sequences and host cells transfected with these polynucleotide sequences. The present invention further provides for functional variants and homologues of these polynucleotide sequences and the polypeptides encoded by these polynucleotides. Libraries of polypeptides are also provided. Also included in the present invention is the use of these polypeptides and libraries of polypeptides in screening odorant molecules to determine the correspondence (scent representation, scent fingerprint or scent profile) between individual odorant receptors (the polypeptides) and particular odorant molecules. Also encompassed by the present invention is the use of the scent representation, scent fingerprint or scent profile to re-create and edit scents.

## CLAIMS

What is claimed is:

- 5           1.     An isolated and purified polynucleotide sequence encoding an olfactory receptor and having the nucleotide sequence selected from the group consisting of SEQ ID NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through SEQ ID NO:152, or a nucleotide sequence that is at least about 95% homologous to a nucleotide sequence of the group consisting of SEQ ID NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through  
10   SEQ ID NO:152 and encoding a polypeptide having olfactory receptor function.
2.     An expression vector comprising a polynucleotide sequence of claim 1.
3.     A host cell comprising the expression vector of claim 2.
- 15           4.     An isolated and purified olfactory receptor polypeptide comprising the translated sequence of SEQ ID NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through SEQ ID NO:152, or a polypeptide sequence that is at least about 95% homologous to a polypeptide sequence of the group consisting of the translated sequence of SEQ ID  
20   NO:1 through SEQ ID NO: 73 and SEQ ID NO:111 through SEQ ID NO:152 and having olfactory receptor function.
5.     A host cell expressing a polypeptide of claim 4 or a functional fragment thereof.
- 25           6.     A phage expressing a polypeptide of claim 4 or a functional fragment thereof.
7.     A preparation containing a polypeptide of claim 4, further comprising  
30   biological or synthetic molecules which maintain the functional structure of the polypeptide.

8. An isolated and purified polynucleotide sequence encoding an olfactory receptor and having the nucleotide sequence selected from the group consisting of SEQ ID NO: 153 through SEQ ID NO: 1084 or a nucleotide sequence having a sequence at least about 95% homologous to a nucleotide sequence of the group consisting of SEQ ID NO: 153 through SEQ ID NO: 1084 and encoding a polypeptide having olfactory receptor function.
9. An expression vector comprising a polynucleotide sequence of claim 8.
10. A host cell comprising the expression vector of claim 9.
11. An isolated and purified olfactory receptor polypeptide comprising the sequence of SEQ ID NO: 1085 through SEQ ID NO: 2008, or a polypeptide sequence that is at least about 95% homologous to a polypeptide sequence of the group consisting of SEQ ID NO: 1085 through SEQ ID NO: 2008 and having olfactory receptor function.
12. A host cell expressing a polypeptide of claim 11 or a functional fragment thereof.
13. A phage expressing a polypeptide of claim 11 or a functional fragment thereof.
14. A preparation containing a polypeptide of claim 11, further comprising biological or synthetic molecules which maintain the functional structure of the polypeptide.
15. A library of olfactory receptors suitable for determining the interaction pattern of a composition with the receptors, comprising the expression products of at least two polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

16. A library of olfactory receptors according to claim 15, wherein the library comprises the expression products of at least 50 polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through  
5 SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

17. A library of olfactory receptors according to claim 15, wherein the library comprises the expression products of at least 100 polynucleotides of SEQ ID NO:1 through  
10 SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

18. A library of olfactory receptors according to claim 15, wherein the library  
15 comprises the expression products of at least 200 polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

20 19. A library of olfactory receptors according to claim 15, wherein the library comprises the expression products of at least 500 polynucleotides of SEQ ID NO:1 through SEQ ID NO: 73, SEQ ID NO:111 through SEQ ID NO:152, and SEQ ID NO: 153 through  
SEQ ID NO: 1084 wherein said polynucleotides encode functional olfactory receptors; or functional fragments of said expression products.

25

20. A library of olfactory receptors suitable for determining the interaction pattern of a composition with the receptors, comprising at least two polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008, wherein said polypeptides are functional olfactory receptors; or functional fragments of said polypeptides.

30

21. A library of olfactory receptors according to claim 20, wherein the library comprises at least 50 polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008,

wherein said polypeptides are functional olfactory receptors; or functional fragments of said polypeptides.

22. A library of olfactory receptors according to claim 20, wherein the library  
5 comprises at least 100 polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008,  
wherein said polypeptides are functional olfactory receptors; or functional fragments of  
said polypeptides.

23. A library of olfactory receptors according to claim 20, wherein the library  
10 comprises at least 200 polypeptides of SEQ ID NOS of SEQ ID NO: 1085 through SEQ  
ID NO: 2008, wherein said polypeptides are functional olfactory receptors; or functional  
fragments of said polypeptides.

24. A library of olfactory receptors according to claim 20, wherein the library  
15 comprises at least 500 polypeptides of SEQ ID NO: 1085 through SEQ ID NO: 2008,  
wherein said polypeptides are functional olfactory receptors; or functional fragments of  
said polypeptides.

25. A method for determining the binding pattern of a composition with  
20 olfactory receptors, comprising the steps of:  
exposing the composition to a library according to claim 21; and  
determining whether the composition binds to each olfactory receptor, thereby  
determining the overall binding pattern of the composition.

25 26. The method of claim 25, wherein the composition consists essentially of one  
compound or chemical.

27. The method of claim 25, wherein the composition comprises at least two  
compounds or chemicals.

30 28. The method of claim 25, wherein the step of determining whether the  
composition binds to each olfactory receptor further comprises a determination of the

approximate binding constant with which the composition binds to each receptor or functional fragment thereof.

29. The method of claim 25, further comprising the step of determining whether  
5 a receptor or functional fragment thereof to which the composition binds is activated.

30. The method of claim 29, further comprising the step of determining the absolute or relative amount by which the receptor or functional fragment thereof is activated.

10

31. A DNA array or a DNA chip comprising DNA segments derived from SEQ ID NO: 153 through SEQ ID NO: 1084.

32. A method of determining differences among individuals with respect to their  
15 olfactory faculties, comprising the steps of comparing the olfactory DNA of the individual against the array or chip of claim 31.

33. A method to determine single nucleotide polymorphisms in olfactory receptors, comprising the steps of uniquely amplifying olfactory receptor sequences from DNA  
20 obtained from one or more individuals, based on primers designed according to the first 25 bases and the last 25 bases of any combination of, or each of, SEQ ID NO: 153 through SEQ ID NO: 1084, and determining the similarities and differences between said amplified DNA and the corresponding receptor from SEQ ID NO: 153 through SEQ ID NO: 1084.

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&lt;220&gt;

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&lt;211&gt; 318

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&lt;400&gt; 1835

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&lt;211&gt; 330

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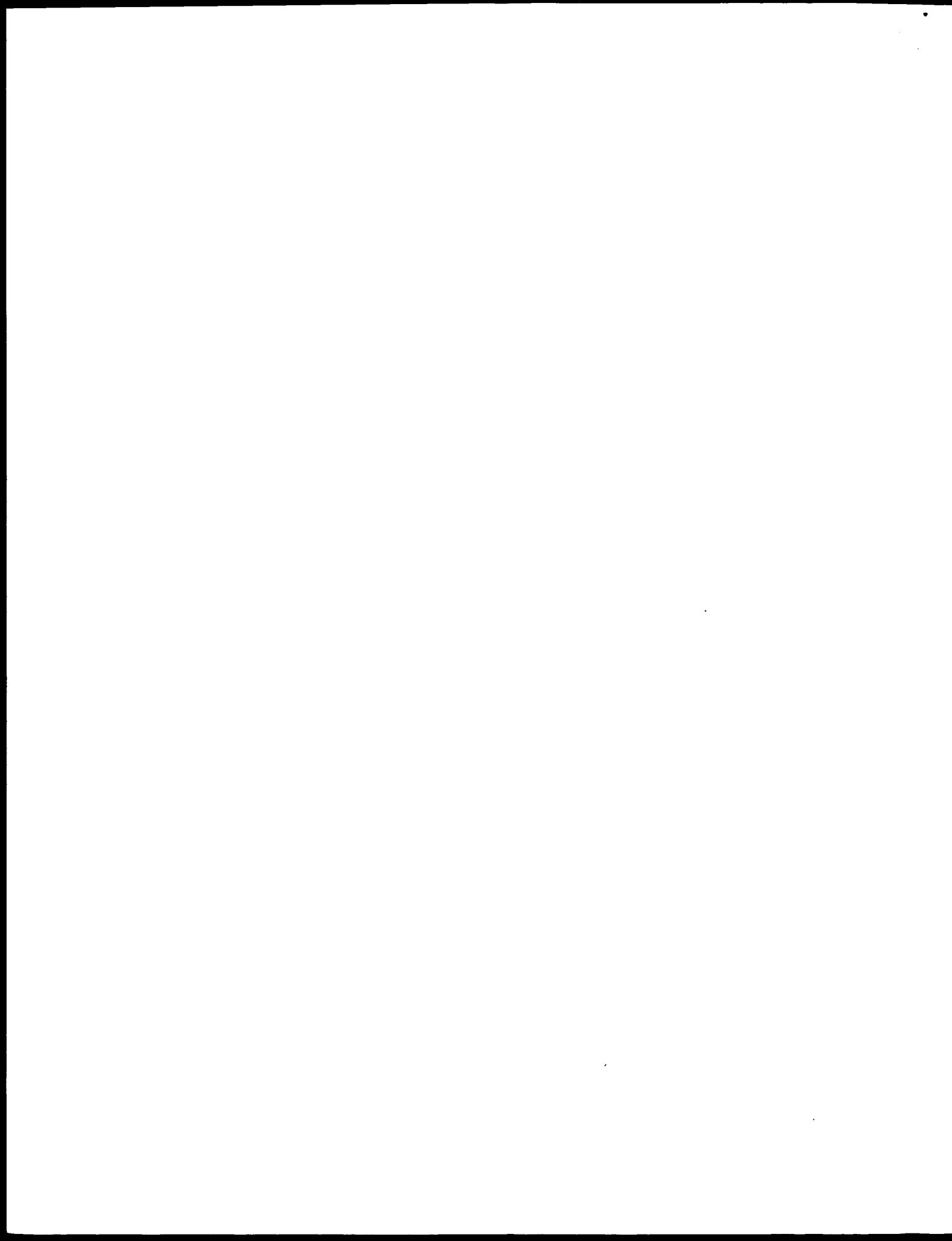
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&lt;400&gt; 1836

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&lt;210&gt; 2183

&lt;211&gt; 317

&lt;212&gt; PRT

&lt;213&gt; Homo sapien (7658481-18-4217-6941)

&lt;400&gt; 2183

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 50 55 60  
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 Glu Ser Ser Val Leu Leu Ala Met Ser Val Asp Cys Tyr Val Ala Ile  
 115 120 125  
 Cys Cys Pro Leu His Tyr Ala Ser Ile Leu Thr Asn Glu Val Ile Gly

